The Northwest Technology Transfer Center
BULLETIN
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A newsletter of the Rural Technical Assistance Program (RTAP)

INSIDE

Please check mailing on back. If incorrect, please contact Donna Stallings at the Center.

Free/Low Cost Training

by George D. Crommes, P.E.

A simple truth is that training is never done. New technologies, new people, and the need for refreshment of what may have been forgotten provide the basis for training.

Forward

The need for training in public works is becoming more important than ever. People with technical skills of many types are needed everyday by those providing services to the public. Many of us forget there is a wealth of training sources and ways to provide training for our employees and many training opportunities are either free or inexpensive.

Before we embark on a training program we must analyze our training needs based upon the requirements of the job and the determination of those skills either lacking or needing enhancement. Needs may vary depending upon our agency's or company's objectives and work and the existing skill levels of our employees.

A simple truth is that training is never done. New technologies, new people, and the need for refreshment of what may have been forgotten provide the basis for training. Training also enhances morale and reduces employee turnover. Hence training is not only needed, and good for us, but it also can save our agency or company money. Free or low-cost training resources are listed in the following material. All are applicable to local agencies who wish to enhance their employee's skills at little or no cost.

Brown Bag Training

There's a wealth of experience in one's own agency or company that could be tapped for training purposes. Many professionals, in particular, are more than willing to make presentations at informal "brown bag" lunch sessions whereby "experts" can enhance the learning curve of their fellow employees. This technique is used more by private companies than public agencies however its potential for improving employee's skills is valid for either public or private enterprise.

Teacher-Mentors

Another training process renown in ancient Greece and used extensively in the manufacturing industry and the military is the teacher/mentor technique. This training approach is used sparingly today in public works. What a great way to impart some of the knowledge and skills of experienced people to those that are "learning the ropes" of their job or profession.

By this technique, a new employee is trained and tutored by a more experienced person until the new employee is comfortable and efficient at his work. Both persons gain, the newer employee gains better skills and knowledge and the tutor gains self satisfaction and skills in instructing others.

The use of teams can also be considered a type of the teacher-mentor approach whereby individuals of a team learn throughout a project from the more experienced team members. One consultant noted problems with the mentor/student technique if the mentor's years of experience far exceeds that of the student (a). In this case it is better to provide a mentor with less experience, e.g. 5-10 years. This problem could also occur if the student has limited skills and interests and the mentor is a professional with higher career objectives and interests.

(a) Michael R Mariano, CH2M Hill, "Training in the Private Sector: A Shared Responsibility" a presentation at the 40th Annual Road Builders' Clinic, 1989 in Moscow, Idaho.

Home Study

Some companies and agencies encourage or require home study courses. Numerous home study programs are available to enhance employees' skills from trade associations, universities, and others. Examples of home study courses include:

Basic Statistics by WSDOT

Construction Project Administration and Claims Avoidance, from ASCE

Untangling the Web of Liability, by CH2M Hill for their project managers

In addition, the various libraries provide a wealth of information whereby one can read and learn at his/her pace and become quite familiar with a subject and skillful in performing work related to the subject.

In-house Workshops

In-house workshops are developed and held for one's own agency or company. Larger governmental agencies or firms with the proper resources provide internal workshops for their people. State agencies in particular make use of this type of training, whereby staff of one agency is made available to teach 1-2 day workshops on a general subject for other state agencies.

Community Enrichment Programs

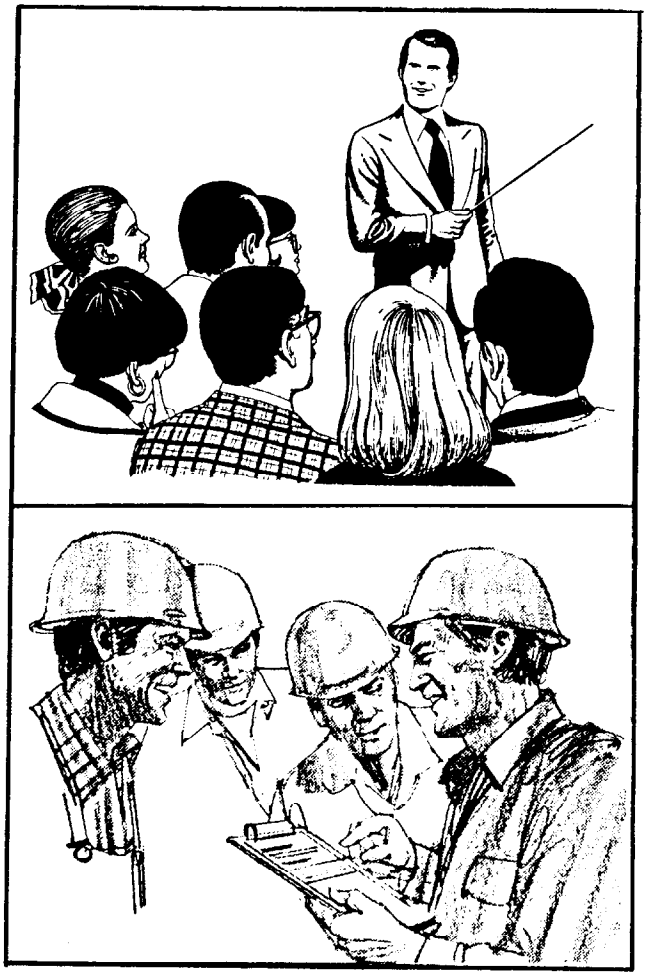
Enrichment programs are available in most urban areas and in some rural areas via community colleges, local schools, and trade schools. In general, most of these are inexpensive and many courses are offered, credited and noncredited, which provide training in skills or skill enhancements needed for our jobs. Examples of these courses include: basic supervision, basic management, and computer operation.

Refresher courses are also available at our community colleges for engineers — in training. Efforts presently are underway to have construction flagging and commercial driver licensing training at the community colleges in Washington.

Training Via Associations

It seems that there is an association for practically every profession and for all levels of expertise. People learn from participation in these associations, and many associations also provide training for their members via formal courses. For example, certification and training programs are offered by the International Municipal Signal Association (IMSA) for fire alarm technicians, signs and markings technicians, traffic signal technicians, and public safety dispatchers. Others which offer training workshops on a variety of subjects include:

- International City Managers Association (ICMA)
- American Society of Civil Engineers (ASCE)
- Institute of Transportation Engineers (ITE)



- American Public Works Association (APWA)
- National Society of Professional Engineers (NSPE)
- County Road Administration Board (CRAB)
- Association of Washington Cities (AWC)
- Washington Association of County Road Supervisors (WACRS)

Training by Vendors/Suppliers

Training by vendors and suppliers is provided to public agencies. Obviously these firms are trying to convince people to buy their products or services, however many workshops are quite general with the sales pitch occurring at the end. Others hold very inexpensive workshops. For example, the Asphalt Institute provides the opportunity for various presenters to provide information on the latest techniques and materials. The one day Annual Asphalt Conference costs $25 per person including lunch — what a bargain!

Free/Low Cost Training (continued)

Consultants and Training Companies

Consultants providing training have increased dramatically. Many firms offer short (1-2 day) courses at a very reasonable cost and many subjects are offered at multiple locations. Most courses are oriented towards management, personnel, computers, filing, and other types of office needs. Examples of providers include Skillpath, National Seminars Group, Learning Centers International, Seminars International, and National Career Workshops. Costs per student vary from $69 to $150 per day.

Training by the T² Centers

Even though these centers were created to provide training regarding transportation, many of them also offer related training courses on supervision and management. The Northwest T² Center, serving the public agencies in Washington, conducts free or inexpensive workshops on numerous subjects. Arrangements have also been made to allow local agency participants at WSDOT training courses. Staff of the Center coordinate with others including those at universities in providing conferences and seminars with multiple training opportunities. Examples of coordinated efforts include the WSU's Road Builders' Clinic and Road Schools.

The NWT² Center's "road shows" provides informal face to face technology transfer to the user at his/her place of work. A van fully equipped with audio visual materials and equipment is used each spring and fall. Approximately 100 "road shows" are held each year at no charge to the agencies. Our trainer, with over 30 years of roadway construction, maintenance, and management experience, provides an opportunity for agencies' personnel to ask questions and share their experiences and ideas.

In addition to the "road shows" the NWT² Center provides formal workshops which may have been custom made for a particular need. In 1991, the Center held custom made workshops on risk management and an orientation workshop on the Local Agency Guidelines (LAG), a manual used by local agencies for their federal-aid projects.

Other training opportunities in the transportation or management area are publicized by the Center in a quarterly newsletter and a flyer, and also placed upon an electronic bulletin board.

Summary

Numerous sources of free or low-cost training is available. Internal sources include brown bags sessions, teacher/mentor programs, home study and in-house formal workshops. All are viable ways to train one's people efficiently and inexpensively.

Agencies or companies also have access to many external training opportunities. These include classes held in the community as part of enrichment programs, classes by training companies, by vendors, by trade or professional associations and by colleges and community colleges. In addition, free and/or low cost training is available through the Technology Transfer Center. If we take full advantage of these inexpensive or free training opportunities or techniques, we can make great progress in increasing the skills of our people in serving the public.

Corps Offers Research Grants

The US Army Corps of Engineers is seeking proposals for cost-shared research, development, and technology transfer projects to assit the US construction industry in enhancing productivity through advanced technology, materials, and construction management systems.

Proposals for the Construction Productivity Advancement Research Program (CPAR) will be accepted until February 28, 1992. Participation is open to any private firm, academic institution, units of state and local governments, and others interested in enhancing construction productivity and competitiveness. The cost of each project will be shared by the Corps and the construction industry partner, with no more than 50 percent of the cost borne by the Corps. "In-kind services" may be considered as part of the cost-share agreement.

For further information, contact Jesse Pfeiffer, Jr., HQUSACE CERD-C; 20 Massachusetts Avenue NW, Washington, D.C. 20314-1000, or call (202) 272-1846 or (202) 272-0257.

Bright Idea Keeps Controllers Warm

Keeping equipment working when the temperature falls below freezing is a constant battle, and traffic signal control boxes are not exempt.

An easy way to keep both mechanical and electrical control boxes working throughout the winter is to install a socket and light bulb. Heat from the light bulb keeps the temperature inside the controller box at around 32 degrees.

Spare sockets and bulbs from signal heads work, as do standard bulbs. Sixty and 100 watt bulbs are recommended. Wire one of the socket lead wires to a neutral contact and the other to a hot contact. Putting in the bulb finishes the job and keeps the controller box warm for the rest of the winter.

The bulb should be placed away from any of the wires in the box. The heat will eventually melt the insulation and cause the controller to fail.

The same idea can be used in other equipment. For example, extremely cold temperatures inside fuel allocation control sheds keep the system from dispensing fuel. A high-intensity bulb in the shed keeps the temperature high enough for the system to work.

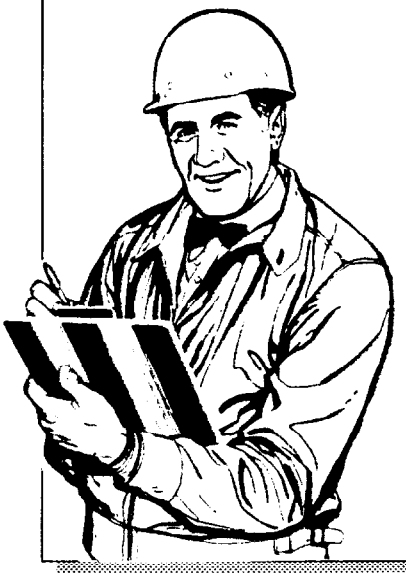
(Source: Kansas T² Center's newsletter of August 1991. Originally from Technology News, December 1990.)

Any Writers Out There?

We are continually looking for technical and management materials from our readers. Do you have a particular subject that you want to share with others in public works? Are there any innovations, success stories, or general news that you have been putting off telling others? We can help you. Contact me, George Crommes, at (206) 753-0143 or SCAN 234-0143. Remember, others can benefit from your experiences and ideas. I am looking forward to your call or letter.

Where do I find technical materials for that subject?

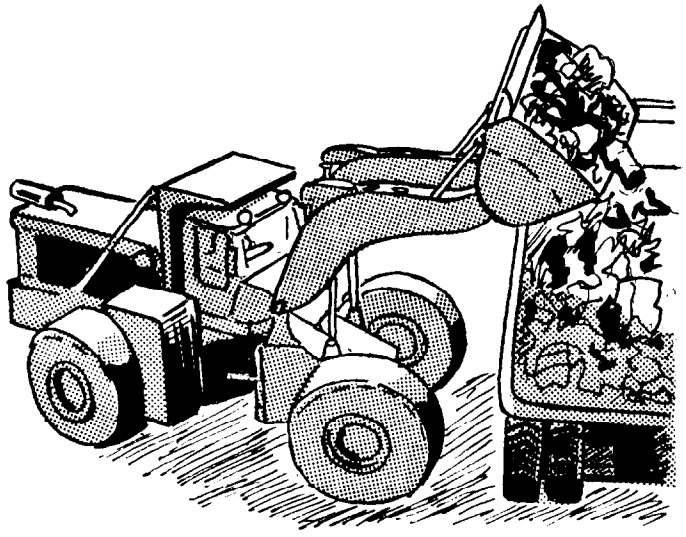
Contact WSDOT's Library (a free T² resource)



Call Barbara Russo at

(206) 753-2107
SCAN 234-2107

Fuel Quality and Your Fleet



Everyone has benefited, more or less, from the most energy-efficient heat engine devised — the diesel engine. In fact, diesel engines and diesel fuel are taken for granted while their effects on the environment are tolerated less and less.

Over the past decade, due to increasingly stringent federal and state standards, engine manufacturers have been driven to seek every possible avenue to meet serious challenges to the future of the diesel engine. They have created turbo chargers, traps, electronic fuel injection, and catalytic converters. At the same time, refiners are being asked to produce cleaner-burning, low-sulfur fuel that many times may not be as efficient, readily available, or economical as diesel fuel.

Diesel fuel quality has deteriorated substantially in recent years, however. Most drivers, fleet operators, and mechanics are aware of this fact. What is not understood is why reduced fuel quality results in increased maintenance problems, operating costs, and emissions. Reduced engine life and performance are the costs of low-quality fuel. Research and test results indicate problems in the following areas.

Fuel Contamination

With increases in oil prices, refineries have been trying to maximize the amount of high-priced fuels produced from each barrel of crude oil. The result is greater amounts of tar, resins, and paraffins in fuel that leave deposits and buildup in fuel lines and injectors and on pistons and cylinder walls. Costly repairs usually result.

Water and Sulfur

Diesel fuel's low volatility invites water contamination, both in storage and during the combustion process. Diesel engine manufacturers want their engines to run hot enough to drive out unwanted water, which becomes a building block for sulfuric acid, but not so hot as to overheat. A gallon of water is formed with each gallon of diesel fuel burned, and up to 5 pounds of sulfur can pass through a large diesel engine daily.

If these two contaminants condense together (in a cold engine) rather than being driven off with the exhaust, sulfuric acid will result. The sulfuric acid eats away at critical engine parts (rings, pistons, liners, crankshafts, and other parts).

Water causes even more severe problems to injectors by stripping fuel (which doubles as a lubricant) from the pumps precision parts. Then, when the larger water molecules are forced through the injector nozzles, they literally blow out the precision tips.

Cetane

High-quality diesel fuel is refined for fast, spontaneous burning. The rate of combustion is measured in terms of cetane numbers. One hundred (100) is a very fast burn and zero (0) is a very slow burn. Most truck or automotive diesel fuel is No. 2 and has a cetane rating of about 45.

Cetane ratings have decreased dramatically in the last 20 years. The cetane number is critical to ignition quality. The audibility of diesel knock is directly related to the cetane rating. The knock is caused by the delay between ignition of the fuel and burning of the fuel. The shorter the delay, the less knock and the smoother the engine performs.

The need for fuel modification is rapidly increasing because of the problems of contaminations and low cetane ratings.

ASDTMD-86 distillation test is used to measure the burn cycle of diesel fuel. The goal is to even out the combustion cycle, speed up the burn, and, most importantly, reduce carbon buildup and contamination by utilizing more of the fuel in the combustion cycle (as evidenced by the difference in loss and recovery).

Solutions

Combustion modifiers are available to improve fuel efficiency. Improved efficiency lowers visible exhaust smoke and provides significant reductions in maintenance costs. Detergent packages, when used in conjunction with combustion modifiers, can remove existing carbon deposits and aid in preventing new formations throughout the entire fuel system.

Algae/bacterial agents and surfactant products, not available in either No. 1 or No. 2 diesel fuels, help disperse and control water and algae/bacterial growth in storage tanks.

(Source: Reformatted from material in Tech Transfer No. 32, January 1991. University of California Berkley T² Newsletter.)

Innovations

by Randy Deer

This column is dedicated to innovations that can be shared among agencies. These innovations can be simple, such as an easier way to install a sign, to more complex, as a new management accounting system. All ideas are welcome. Please contact us.

Snowplow Attachment

With public works crews gearing up for winter weather, here is an idea that will help protect your guardrail and jersey barrier while snow plowing.

The Oregon Department of Transportation's Highway Division is using a rubberized roller on their snowplows to keep the plow from scraping against median barriers or guardrail.

Their own shop furnishes the 18-inch long steel cores, which are turned from 3-inch diameter stock down to 1-inch diameter by 3-inch long shafts on each end. The cores are then shipped to Columbia Rubber Mill in Portland, where the rubber is laminated in 1 ½-inch layers to a total diameter of 6 inches.

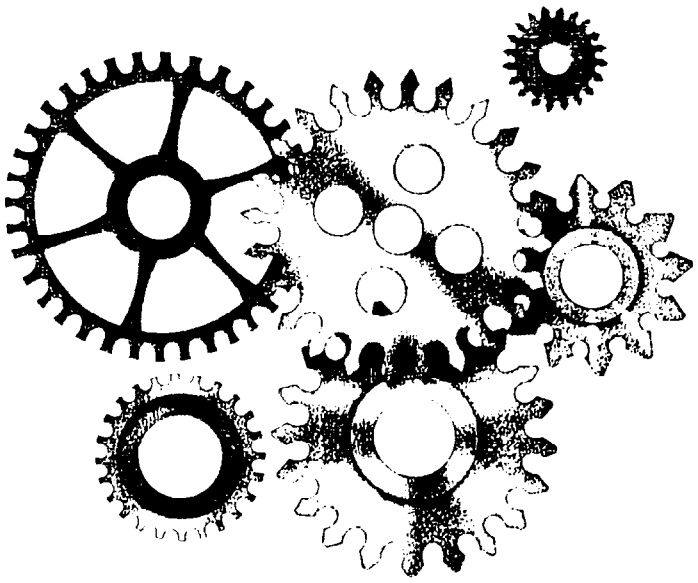
These units are then mounted on the plows with 1-inch pillow block bearings.

In 1985 the material and labor cost for the steel core was $47.25 and the rubber coating came to $117.25.

Innovative Use of Equipment

With budgets getting tighter all the time, agencies might want to look at new ways of acquiring safety equipment.

In 1984 a truck-mounted, low-cost, early warning sign was shown at the Tri-State Maintenance Conference. This sign, manufactured by Oregon DOT, is very similar to the units being used by WSDOT. Vehicle mounts and trailer mounts are available.



The unit is a flashing arrow board capable of moving traffic to the left, to the right, left and right simultaneously, or a straight flashing bar. The control panel mounts to the dashboard of the vehicle for easy access to the controls and proper selection of the pattern of lights desired. Parts are easily attainable for all portions of the sign, control panel, and wiring harness.

The advantage of this employee built unit is a cost of $300, compared to $800 (1984 dollars) for a manufactured unit. Signs can be interchanged between vehicles, are effective both night and day, and all parts are easy to repair and replace.

Conclusion

The above are ideas from various agencies. Maybe you have an idea or a problem for which the staff or another reader might have an innovative solution. Give us a call or write us describing your idea or situation and we will see if someone has a answer to your question.

In the News

Breakaway Timber Utility Poles to Receive Coordinated Testing

The Office of Technology Applications (OTA) has undertaken a coordinated effort to test and evaluate the inservice performance of Breakaway Timber Utility Poles (BTUP). The Kentucky and Massachusetts DOTs are two agencies testing this highway safety hardware. To date, there have been several hits of the breakaway pole installations in Massachusetts, and all of the poles performed successfully. In September, the Washington DOT joined in this test and evaluation effort. Washington will install both new and retrofitted BTUPs at selected sites. All of the poles should be in place by the summer of 1992, with a final performance evaluation report completed in June 1994. Additional states are encouraged to join in this testing and evaluation effort. — Vincent Nowakowski, FHWA

(Source: FHWA's Research and Technology Transporter, October 1991.)

Bee Sting Kit Recall

Bee season has come and gone. Before it rolls around again, make sure any employee who carries a bee sting kit has checked it for recall. Several lots of epinephrine injectors have been mislabeled for dosage.

A toll-free hotline has been set up. Have employees with kits call this number for information: **1-800-879-9938.**

Bee allergies are life threatening! Let's take care of this before exposure occurs.

(Provided by Ms. Jan Hearne, Safety Resource Assistant, District 1 Safety, WSDOT.)

NACE Action Guide on Highway Safety Improvements Now Available

This guide was prepared by the National Association of County Engineers (NACE) to assist county agencies to identify various road hazards that may be present on their roads and to help them in developing safety improvements. Basically, the guide is directed toward rural counties with a very limited engineering staff.

The guide covers hazards and their cures (includes sight distance in curves, narrow bridges and culverts, railroad crossings, construction and maintenance zones, and sign vandalism), developing a safety improvement program (includes identifying problem locations, developing cost-effective projects, setting priorities, etc.), roadway lighting (including design of light poles and location of lighting), and guardrails (includes types of guardrails and end treatments).

If you want your own copy ($6.00 each for nonmembers, $4.00 for members of NACE), call NACE at (202) 393-2630.

(Source: Kentucky T² Center's The Link, Summer 1991.)

Conferences and Meetings

- Traffic Expo '92, January 18-22, 1992, Phoenix, Arizona. Contact Shawn Scott (703) 898-5400.
- 1992 Northwest Roads and Streets Conference, February 5-7, 1992, Corvallis, Oregon. Contact Bob Layton, OSU, (503) 754-4273.
- Law Enforcement and Engineer's Conference, February 19-20, 1992, Wenatchee, Washington. Contact Ed Lagergren (206) 753-1073.
- 19th Annual AEMA Meeting and 16th Annual ARRA Meeting, February 26-29, 1992, Fort Lauderdale, Florida. Contact Mike Krissoff (301) 267-0023.
- Road Builder's Clinic, March 3-5, 1992, Red Lion East, Spokane, Washington.
- The National Minority Environmental Career Conference, March 21-24, 1992, Atlanta, Georgia. Contact Peter Kimpton, (617) 426-4375, ext. 132.
- 41st Annual Vehicle Maintenance, March 23-26, University of Washington. (206) 543-5539.
- National T² Conference, August 2-5, 1992, Lexington, Kentucky.
- WA Chapter APWA Spring Conference, March 25-27.
- WACRS Conference, April 21-23, Yakima.
- National Public Works Week, May 17-23.
- Asphalt Conference, October 26, Moscow, Idaho. Contact Ed Schlect (206) 786-5119.
- Pacific Rim Transtech Conference, August 12-19, 1993, Seattle, Washington. For more information, contact James R. Buss, WSDOT, (206) 753-6014.

Railroad Crossings

by Ed Lagergren, P.E.

(In the past few months I have received several calls about the signing and pavement markings at railroad crossings. This article is intended to help and/or refresh your memories and to pass on what I have learned recently about railroad crossings.)

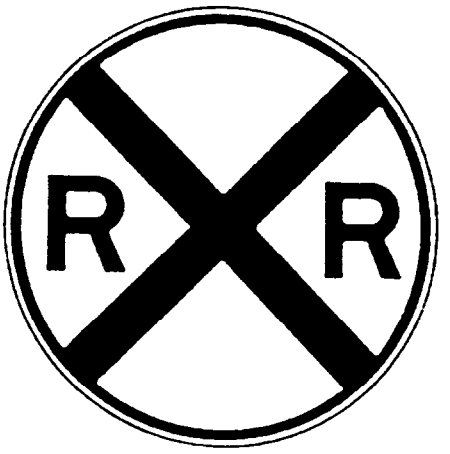
I was shocked twice in the past month when I talked with personnel from the Utilities and Transportation Commission (UTC). I learned that people commonly drive around railroad crossing gates that are down and have the red lights flashing. Some drivers get away with it; some do not. The UTC is planning a program in which policemen ride the trains. When they see a violator, they radio to an associate near the crossing and the offender is given a ticket. Other states have already implemented this program. Many tickets have been written and hopefully people are learning to obey the warnings.

The other concern is that the railroads have installed many new signals and maintenance budgets are not being increased accordingly. Maintenance on active grade crossings in some cases may not be adequate. This concern was brought up in conjunction with hazardous/flammable material carriers and school busses not stopping at active crossings in Washington State. As a driver of a vehicle you should be concerned about inadequate maintenance. If you notice a problem, report it quickly to a local law enforcement dispatcher.

The Utilities and Transportation Commission has a program entitled Operation Lifesaver to educate people about the dangers of railroad crossings. The commission has several people available for group presentations. Please contact Hank Naumann at the UTC (206-459-6580) if you would like to learn more about this program.

Now to the heart of the matter. The FHWA establishes standards for traffic control systems at crossings and publishes these in the Manual on Uniform Traffic Control Devices (MUTCD).The FHWA also publishes the Railroad-Highway Grade Crossing Handbook, Second Edition, FHWA-TS-86-215, which provides general information on railroad-highway crossings, including characteristics of the crossing environment and users, and the physical and operational improvements for safe and efficient use by both highway and rail traffic. These two books are the primary references for the engineer assigned to maintain the crossings.

The responsibilities of the highway and the railroad at grade crossings have been evolving since the days of the first trains in the 1830s. Today there are two types of traffic control at railroad crossings. Active traffic control systems have flashing lights or



gates to inform motorists of the train. Passive controls identify and direct attention to the location of the railroad crossing. In 1962 the Interstate Commerce Commission published the report Prevention of Rail-Highway Grade Crossing Accidents Involving Railway Trains and Motor Vehicles. The report states because the highway users receive the benefits from grade crossing improvements they should pay for the improvements. Improvements include the advanced warning and any active warning devices. The crossings' traffic control devices (including the crossbuck) and the crossing surface are maintained by the railroad because the crossing traffic control devices are often integrated into the signal system regulating train operations and into the physical railroad track structure. The railroad is required by law to maintain the crossing surface from one foot outside the tracks. The highway agency is then left to maintain the advanced warning.

Figure 8-2 of the MUTCD illustrates the use of the Railroad Advance Warning (W10-1) sign and the placement of the pavement marking symbol. The critical distances are: the stop bar is to be 15 feet from the nearest rail, the placement of the W10-1 is according to Section 2C-3, Table II-1 Condition B and a portion of the pavement marking symbol should be directly opposite the W10-1. Also, no pass stripe should extend from the pavement marking to the crossing. Multilane approaches should have the pavement symbol in each lane.

Exceptions to the signing and markings in figure 8-2 are made under certain conditions. The Railroad Advance Warning (W10-1) sign is not required on (1) low volume, low speed roadways crossing infrequently used tracks that are flagged by train crews; (2) crossings in urban business districts that have active grade crossing traffic control devices; and (3) crossings where physical conditions do not permit even a partially effective display of the sign. The pavement marking symbol, as discussed in Section 8B-4 Pavement Markings, is required on all paved approach lanes where grade crossing signals or automatic gates are located and all other grade crossings where the prevailing

speed of the highway is 40 mph or greater. The pavement symbol is, therefore, not required on unpaved approaches or paved approaches to a passive crossing with a prevailing approach speed of less than 40 mph. The manual also states in the following paragraph that "The markings shall also be placed at crossings where the engineering studies indicate there is a significant potential conflict between vehicles and trains." I interpret this sentence to mean: Use the pavement markings at every paved crossing unless you have bullet proof documentation why you did not.

In regard to the exceptions when the Advanced Warning sign (W10-1) maybe omitted, I am told by the UTC that in Washington State there is no law requiring train crews to flag any crossing. The train crews are only required by operating rules to flag at a railroad crossing when the engine does not cross first. No crossings in the state are flagged 100% of the time so condition 1 cannot be met. Condition 2, it is interesting that the MUTCD requires pavement markings in business districts at railroad crossings with active controls and not the advanced warning sign. Condition 3, it is hard for me to imagine a situation "Where physical conditions do not permit even a partially effective display of the sign." In conclusion if you do not install an advanced warning sign (W10-1), you better have a well documented reason.

Railroad tracks and highways are often parallel. This creates a problem because often there is not enough distance on the crossroads for the advanced warning between the tracks and the highway. The Railroad Advanced Warning W10-2,3, and 4 are designed to be used on the parallel highway if the distance between the nearest track and the parallel highway is less than 100 feet. Where there is 100 feet or more the W10-1 sign should be installed on the crossroad making the signs on the parallel highway unnecessary. If there is not enough distance for the pavement markings, they should be treated as follows: the stop bar must remain 15 feet from the nearest track, the pavement symbol can then be condensed to fit onto the short approach on the crossroad. The first sentence in the third paragraph Section 8B-4 allows the symbol to be condensed. It states, "...markings shall be essentially as illustrated in figure 8-2." The key word here being "essentially."

One last item of interest for those of you still reading. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 requires the MUTCD to be modified to give states and local governments discretion to install stop or yield signs at any rail-highway grade crossing without automatic traffic control devices with two or more trains a day.

In summary, as traffic engineers, we can not physically stop someone who is determined to ignore our warnings; we can maintain our railroad crossings in accordance with the MUTCD to give the driver every chance to heed our warnings.

If you have any questions or need advice on a traffic problem please give me a call at 206-753-1073 or scan 234-1073.

Free Publications

For Washington recipients only: Contact Donna Stallings at (206) 753-6119 or SCAN 234-6119 if you want publications.

A Guide for Erecting Mailboxes on Highways, AASHTO. This recent guide by AASHTO provides recommended practice for their location, design, and regulation. Designs which are hazardous to the motoring public can be replaced with simple and inexpensive designs. A model regulation is provided for accommodating mailboxes and newspaper delivery boxes on public highway rights of way (10 copies available).

FHWA-TS-90-026, Work Zone Traffic Control Information Catalog. This booklet is intended to be a single information source for references (books, videos, films) on the subject of traffic control and safety in highway construction and maintenance zones (25 copies available).

FHWA-RT-88-039, Improving Operational Safety on Local Roads and Streets. U.S. Department of Transportation. This pamphlet is intended as a general guide to effective, low-cost methods of improving and enhancing operational highway safety. The guidelines and examples included are based on actual situations and observations made in a series of nationwide reviews (25 copies available).

Improving Guardrail Installations on Local Roads and Streets. U.S. Department of Transportation. This pamphlet is intended as a general guide to effective, low-cost methods of enhancing highway safety with guardrails (25 copies available).

Maintenance of Small Traffic Signs. U.S. Department of Transportation. This handbook is intended to help maintenance workers to understand the importance and the priority of maintaining small traffic signs (25 copies available).

Selected References

The following can be obtained directly from the sources listed.

New Book Offerings

The Toolbox for Alleviating Traffic Congestion, ITE. This 154-page report is intended for elected officials, business and community leaders, and others interested in learning the options available for reducing traffic congestion. Contact ITE Bookstore at (202) 554-8050. $25 ITE members, others $35.

Quality in the Constructed Project (1990). This ASCE manual on engineering practice is the updated and improved version of the 1988 preliminary version. It is a guide for owners, designers, and constructors and written for all participants in a construction project. The guide describes a desirable process for project delivery from conception through design, construction, operations, and start-up. ASCE members $21, others $28. Contact ASCE, 345 East 47th Street, New York, NY 10164-0619.

Time Management for Engineers and Constructors. This 1991 book, by Ray G. Helmer, Jr., applies the concepts of time management to the specific tasks and activities of practicing engineers and constructors. ASCE members $12.75, others $17. Contact ASCE, 345 East 47th Street, New York, NY 10164-0619.

Hot Mix Asphalt Materials, Mixture Designs, and Construction. This new book by the National Asphalt Pavement Association (NAPA) with over 500 pages covers asphalt refining, uses, and properties; aggregates; HMA mixture design; asphalt mixture properties; equipment and construction; special mixtures, recycling, and additives; performance/distress of HMA. Available for $45 from NAPA Education Foundation, NAPA Building, 5100 Forbes Boulevard, Lanham, MD 20706-4413 or telephone (301) 731-4748.

12 Tools for Improving Mobility and Managing Congestion. The Urban Land Institute created this booklet to build upon previous publications by identifying successful tools that are being used by many communities to reduce traffic congestion. A wide array of approaches and ideas are noted. Contact Urban Land Institute, 625 Indiana Avenue NW, Washington, DC 20004 or telephone 1-800-321-5011.

Hot-Mix Asphalt Paving Handbook. Covers the state of the art of asphalt paving operations including plant operations, transportation of materials, surface preparation, laydown, and compaction. It is aimed at field personnel who do the work and agency personnel who oversee and inspect the work. Available from APWA, P.O. Box 94310, Chicago, IL 60678-4310. Members $25, nonmembers $30.

Tackling Gridlock. Shows how to improve traffic flow, increase traffic capacity, encourage mode shifts, and manage the traffic system. It makes the congestion problem less perplexing and provides public works administrators, decision makers, and other municipal officers with solutions. APWA. Members $20, nonmembers $30.

Selection and Use of Engineering and Architectural Consultants: Guidelines for Public Agencies. APWA's Institute for Municipal Engineering's latest publication on how to work successfully with engineering and architectural consultants. $5.

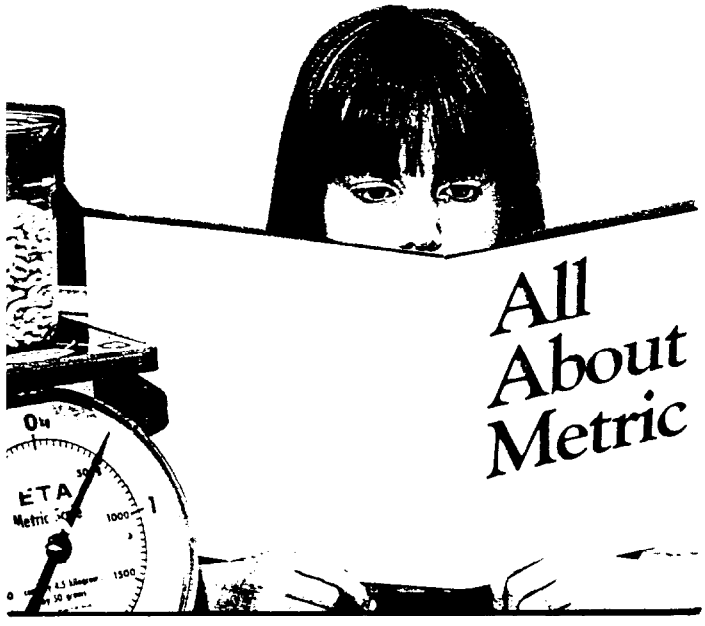
Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings. A comprehensive report from the Building Research Board that demonstrates you should be budgeting 2 to 4 percent of the aggregate current replacement value of buildings for routine maintenance and repair. APWA. Members $20, nonmembers $25.

Water Quality: Urban Runoff Solutions. Helps you develop the comprehensive programs needed to respond to the NPDES requirements. The report shares tested programs and shows how they can fit into the Public Works manager's efforts to plan for stormwater management comprehensively. APWA. Members $20, nonmembers $25.

Public/Private Partnerships in Transportation. This special 100-page, fully-illustrated manual has been prepared by the American Road & Transportation Builders Association, the nationally-recognized educational leader in the public/private partnership field. It is written by internationally respected consultants from firms like Arthur D. Little, Price Waterhouse, Public Financial Management, Morgan Stanley & Company, and Parsons Brinckerhoff Quade & Douglas. And its unique binder format means you'll be able to update your manual as ARTBA-produced revisions are made available. $100. Contact ARTBA, 501 School Street SW, Washington, DC 20024.

Getting Ready to Use the Metric System

by George Crommes



(Note: The Fall 1991 Bulletin had a brief article on the upcoming conversion to the metric system of measurement in the United States. This article expands on the subject and provides some helpful hints for this necessary transition.)

Perhaps you, like me, have been pulling various conversion tables from the files in preparation of the United States' conversion to the metric system of weights and measures used by the rest of the civilized world. FHWA has already set up the following time table which is proceeding on schedule:

- May 1991 — Develop FHWA conversion plan
- May 1992 — Initiate revision of laws and regulations that act as barriers to conversion
- May 1994 — Convert FHWA manuals, documents, and publications to the metric system
- May 1995 — Data collection and reporting
- September 30, 1996 — Metrification of all federal aid construction contracts

Having grown up with the English units of measures, I look forward to the conversion as much as a trip to the dentist. How could I possibly remember all the factors converting feet to meters, pounds to kilograms, gallons to liters, or temperature in Fahrenheit degrees to Celsius degrees? I previously had obtained a table of conversion factors, however, I didn't want to carry this with me everywhere I went in addition to carrying a calculator to multiply three or four place numbers. No, there had to be a better way — a way that is easy, rational, and simple.

Really, there is no need to remember conversion factors if we don't convert numbers from one system to another. Why not start using the metric system in our daily lives? After six months to a year of using metric measurements, it will be as familiar to us as our previous system. Keep in mind that there are only seven basic units in the metric system, compared with over 50 units in the present system! The first step is to hide all measurement devices in the English system and obtain measurement devices of the metric system.

For linear measure, most scales and rulers already have both inches and centimeters on them. A piece of tape can easily cover the inches so that we won't have to look at them again. Liter jugs are already available also, e.g., two-liter pop bottles. After purchasing milk or other liquids, these liquids can be poured into the liter containers. Before long, we will be talking "liters" as if we were brought up with them. Similarly, remembering temperature in Celsius shouldn't be difficult, as freezing is 0°C and boiling is 100°C. A comfortable temperature for humans in the Northwest is 20°-21°C as noted in weather reports by our neighbors in Canada who use the Celsius scale. Similar to the ruler, cover the Fahrenheit side of your thermometer with tape so that you can only read the Celsius side. Measurement of weights in kilograms have the additional advantage of sounding less. For example, my weight is now a light 100 kilograms instead of a heavy 220 pounds.

Most speedometers on newer cars already have speed in kilometers per hour as well as miles per hour. All highway signs will ultimately be completely converted to metric measures. Presently, some signs on the interstates use both metric and English measures. Learning speed in kilometers per hour will be easy for us as the speedometers already tells us this.

In summary, the transition to the metric system will be much easier if we all start using it now. What's stopping us?

Soft Shoulders May Teach A Hard Lesson

Using Common Sense to Maintain Shoulders Will Win Juror's Favor

Shoulder defects are among the most common basis for negligence claims against highway agencies, according to two recent national studies.

A study of highway tort claims against counties in Iowa shows that claims for inadequate shoulders ranked second among all claims categories based on dollar totals for settling claims.

In cases in which this writer has been involved, the plaintiffs have alleged that the highway agency was negligent because a shoulder was unstable. This becomes a problem when a vehicle encroaches upon the shoulder, the driver loses control, and then collides with another vehicle after regaining the pavement.

Granular Material Helps

The AASHTO Maintenance Manual (1976, Section 3.1110) states that "Earth or sodded shoulders should contain a sufficient amount of granular material for stability." Granular material should be added as necessary to fill ruts or soft spots after they appear, but this cannot assure stability.

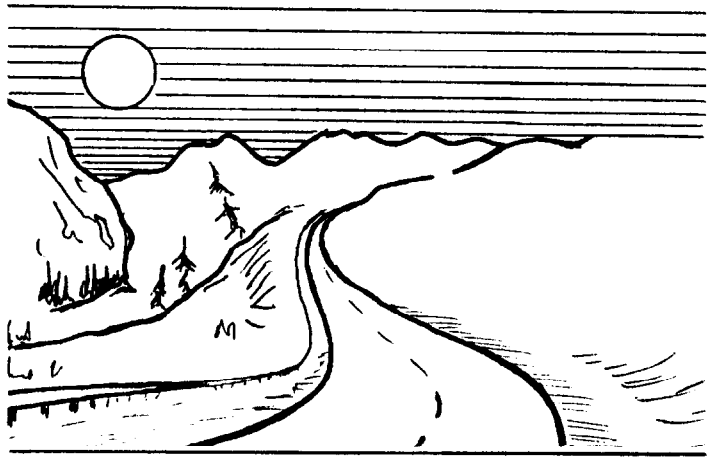
Instability will become a problem after a rain or, in northern climates, in late winter or early spring when the earth thaws. This is especially true on new shoulders or others where vegetative growth has not become well established.

In general, efforts should be directed toward establishing and maintaining grass cover. Blading, when needed, should be done lightly enough to leave grass roots in place.

Shoulder Slope Specifications

A problem with turf shoulders is the gradual buildup of material that will tend to leave the shoulder too high. At least two suits against the state of Iowa have alleged negligence because a shoulder was so high that water could accumulate on the pavement. Obviously, this should not be permitted to happen.

Maintenance standards suggest that shoulders should slope away from a pavement at a rate of at least 0.04. For turf shoulders, a rate of 0.08 rate (one inch/foot) is recommended in AASHTO's Maintenance Manual. Water will not accumulate on pavement with shoulders that are properly shaped with these slopes.



A number of cases against counties have alleged that shoulders on aggregate-surfaced roads were defective. These roads typically are bladed so that there is no clear line of demarcation between the shoulder and the traveled way. However, since aggregate-surfaced roads depend to a considerable extent on the compaction afforded by traffic for stability, the edges are likely to be less firm than the center portion.

Consequently, the edges can be likened to a soft shoulder during certain climatic conditions and can contribute to an accident. A solution to this problem is to assure that the graded portion of the road is limited in width and that the shoulders are maintained correctly in the same manner as turf shoulders on a paved road.

What Juries Look For

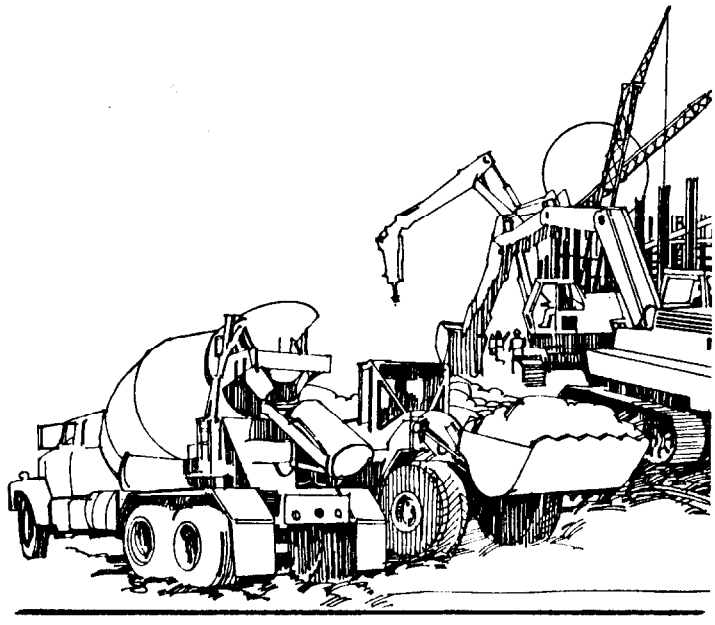
In this writer's experience, juries seem to be quite reasonable in deciding cases in which a soft shoulder has been blamed for an accident. (They are not very tolerant of edge cuts, however.) Typically, a plaintiff's expert will recite from written policies and guidelines that may establish performance levels that are not attainable in practice. However, juries tend to look for application of common sense and a reasonable effort to follow guidelines concerning shape and slope.

In conclusion, use your common sense when you maintain shoulders. If you do, any trip you may make to court on a shoulder case will be much less unpleasant.

(From: The Arizona Roads Newsletter, October 1990)

Credit: R.L. Carstens, Iowa State University

Update of Local Agency Research



by George Crommes and Keith Anderson

Following is an update of local agency research as of the end of 1991. For more detailed information, contact Keith Anderson of WSDOT at (206) 586-8959 or SCAN 321-8959.

Low Speed Crash Test Criteria

The WSDOT Design Standards Engineer has received approval from FHWA on the design criteria for the low speed tests of guardrail designs. A rough estimate of the design and testing costs by the Texas Transportation Institute has been made. Funds from other states through the pooled fund process has begun.

Heavy Vehicles Versus Urban Pavements

The city of Seattle Engineering Department, submitter of this research idea, will be conducting the study with their own personnel. They plan to build on previous work which looked at the effects of the new dual powered buses on the rates of pavement deterioration. The new study will focus on possible mitigating measures that could reasonably be adopted to lessen the damaging effects of bus traffic. The Research Office is awaiting a scope of work from Seattle.

Speed Control Strategies (State of the Art)

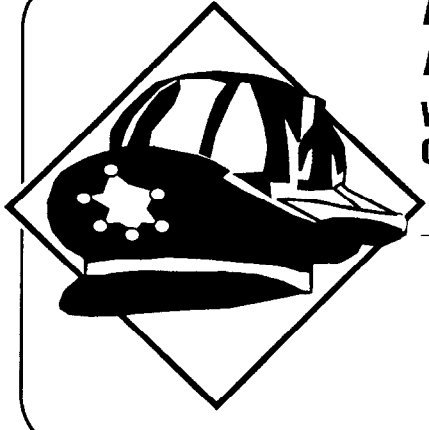
This project will attempt to find workable strategies for controlling speeds on residential streets. The Research Office in its quest to find a principal investigator, discovered that the city of Everett is now in the process of wrapping up a study of neighborhood traffic impact mitigation measures. The Research Office is contracting for an extension of this effort which so closely fits with our scope of work. A technical review committee, chaired by Wayne Wentz, city of Everett Traffic Engineer, is reviewing a proposed work plan for the project.

RoadRater Correlation Study

A request was made of consultants to do the study. The Research Office anticipates final selection of the consultant by mid-January. Hence a detailed work plan will be developed by the consultant prior to proceeding with the study.

PMS Rating Manual

The distress photos have been collected. Keith Kay of WSDOT, working with representatives from the users group, has completed the rough text editing portion of the manual. The principal investigator is now anticipating completion by February 29, 1992.



Law Enforcement and Engineers' Conference
February 19-20

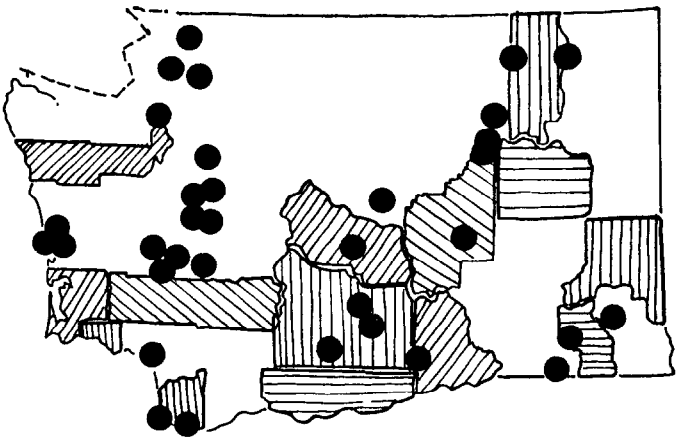
Westcoast Wenatchee Center Hotel
Contact Ed Lagergren at (206) 753-1073

Subject Areas:

- Law Enforcement and Engineering Work Together?
- Success Stories
- Media Relations
- Measuring Your Future — You Have Been Metricized
- Corridor Safety Program Overview
- Neighborhood Traffic Control
- Basics of Engineering and Enforcement
- The View from the Bench

The Fall Roadshows

by Hans Frankmoelle, T² Trainer



No.	Date	Agency	Host	Location	Persons
1	9/23	Lewis County	Bill Forth	Chehalis	9
2	9/24	Washougal	Bob Simmons	Washougal	12
3	9/30	Prosser	Fred Carroll	Prosser	7
4	10/1	Benton Co.	Cliff Coffman	Prosser	12
5	10/1	Benton Co.	Don Mullet	Kennewick	13
6	10/2	Columbia Co.	Tom Bensel	Dayton	15
7	10/2	Pomeroy	Stan Warren	Pomeroy	4
8	10/3	Walla Walla	Stan Williams	Walla Walla	8-10
9	10/8	Jefferson Co.	Earl Wells	Port Townsend	20-26
10	10/8	Port Townsend	Bob Wheeler	Port Townsend	13-15
11	10/10	Bonney Lake	Bruce Gould	Bonney Lake	14-15
12	10/11	Des Moines	Frank Olson	Des Moines	11-13
13	10/15	Yakima (city)	Ken Kohagen	Yakima (city)	39-47
14	10/15	Wapato	Don Groth	Wapato	12
15	10/16	BIA-Yakima Ind.	Jim Arnoux	White Swan	7
16	10/17	Klickitat Co.	Steve Nygaard	Goldendale	9-14
17	10/17	Klickitat Co.	Steve Nygaard	White Salmon	9
18	10/21	Grant Co.	Everett Smith	Quincy	19
19	10/22	Grant Co.	Dave Arbuckle	Moses Lake	13
20	10/23	Lincoln Co.	Bob Brashear	Davenport	30
21	10/23	Lincoln Co.	Bob Brashear	Wilbur	22
22	10/24	BIA	Wayne Kensler	Nespelem	11
23	10/25	Yakima Co.	Earl Foreman	Yakima	41
24	10/28	Moses Lake	Leon Frechette	Moses Lake	11
25	10/29	Ferry Co.	Larry Beardslee	Republic	11
26	10/29	Ferry Co.	Larry Beardslee	Inchelium	12
27	10/30	Colville	Craig Brown	Colville	8
28	10/31	Grand Coulee and Coulee Dam	Frank Thomas	Grand Coulee	8
29	11/5	Bellingham	Gary Almy	Bellingham	24
30	11/6	Anacortes	Doug Terry	Anacortes	11
31	11/7	Mount Vernon	Darrell Tawes	Mount Vernon	4
32	11/12	Whitman Co.	Craig Patterson	Colfax	35
33	11/13	East Wenatchee	Bob Goodman	East Wenatchee	4
34	11/14	Ellensburg	Paul Rugh	Ellensburg	18
35	11/14	Kittitas Co.	Larry Bland	Kittitas Co.	17
36	11/15	Milton	Darwin Meyers	Milton	8
37	11/19	Longview	Steve Harris	Longview	14
38	11/19	Wahkiakum Co.	Jack Tobin	Cathlamet	10
39	11/20	Pacific Co.	Charles Mikkola	Long Beach	10
40	11/20	Pacific Co.	Charles Mikkola	Raymond	9
41	11/22	Oak Harbor	Jim Croft	Oak Harbor	22
42	11/25	Ocean Shores, Westport, Aberdeen, and Hoquiam	Ron Marila	Aberdeen	16
43	11/26	Yelm, Bucoda, and Eatonville	Tim Peterson	Yelm	6
44	11/27	Tumwater	Robert Legg	Tumwater	10
45	12/3	Issaquah	Jim Brown	Issaquah	10
46	12/3	Bothell	Ron Fagg	Bothell	14
47	12/5	Clark Co.	Bud Cave	Vancouver	16
48	12/5	Vancouver	Bob Tabor	Vancouver	14

48 sessions; 48 agencies; 695 people; 1,822 person hours of training

Educational Opportunities

The purpose of this column is to inform you of the numerous educational opportunities that exist for our Washington State and adjacent states' transportation people. We also place this information on our electronic bulletin board.

Battelle

Registrations for workshops are taken on a first come, first serve basis. Call Battelle at (206) 527-0524 for additional information on workshops. Classes listed are in Seattle.

- The Manager as Leader. June 3-5, December 7-9. Cost $1,145.
- The Effective Manager. April 13-15, October 13-15. Cost $895.
- The Engineer as Manager. June 1-2, December 3-4. Cost $975.
- Effective Project Management. March 19-20, October 5-6. Cost $975.
- Managing Computer Projects. May 11-12, July 27-28, November 16-17. Cost $975.

Northwest Technology Transfer Center (206) 753-1028

The T² Center offers or supports numerous workshops of interest to public works agencies in Washington. Announcements are advertised in the newsletter, the Bulletin, and flyers are sent to public works agencies requesting their interest prior to the workshops.

- Risk Management Workshops. (Tentative dates and locations are as follows. Announcements will be developed and sent out prior to the workshops.) March 11, Spokane; March 12, Yakima; March 17, Kelso; March 19, Marysville.

County Road Administration Board (CRAB)

If there is a special class you would like to see developed for counties, contact CRAB at (206) 753-5989.

National Seminars Group (800) 258-7246 or (913) 384-6400

- Leadership and Supervisory Skills for Women. January 22, Spokane; January 23, Pasco; January 24, Yakima; January 25, Seattle and Portland. Cost $69.
- Business Grammar and Usage for Professionals. January 27, Spokane; January 28, Pasco; January 29, Yakima; January 30, Seattle; January 31, Tacoma. Cost $99.

National Career Workshops (800) 258-7246

- Building Budgeting Skills. February 19, Portland; February 20, Olympia; February 21, Tacoma; February 24, Spokane; February 25, Pasco; February 26, Yakima; February 27, Seattle. Cost $149.

American Society of Civil Engineers (800) 548-2723

- Understanding Wetlands and 404 Permitting. February 7, Portland, OR. Cost $345 members, $395 nonmembers.
- Construction Project Administration and Claims Avoidance. February 27-28, Seattle. Cost $645 members, $745 nonmembers.
- Storm Water Detention Facilities (Design). March 13, 14, Spokane. Cost $645 members, $745 nonmembers.
- Management for the New Engineer: Developing Professional and People Skills. March 19-20, Seattle. Cost $595 members, $645 nonmembers.
- Advances in High Performance Cements and Concretes. April 27-29, Seattle. Cost $745 members, $855 nonmembers.
- Urban Hydrology and Detention Pond Design: A Computer Workshop Featuring the Pond-Pack. April 2-3, Seattle. Cost $645 members, $745 nonmembers.
- Water Surface Profile Computation Using HEC-2. February 6-8, Seattle. Cost $775 members, $875 nonmembers.

Organization for Economic Cooperation and Development

- Workshop on Knowledge-Based Expert Systems in Transportation. June 15-17, Montreal, Canada.

WSU Conferences and Institutes (206) 840-4575

- How to Apply Deming's Quality Improvement Principles to Public Sector Services and Administrative Operations. January 29-30, SeaTac. Cost $695.
- Construction Project Management. February 11-12, Cypress Inn, Kent. Cost $765.
- Introduction to Computer Systems Analysis and Design. February 4-6, Red Lion/Sea-Tac. Cost $895.
- Improving Management Skills of the New or Prospective Manager. February 20-21, Red Lion/Sea-Tac. Cost $695.

University of Washington (206) 543-5539

- Fundamentals/EIT Refresher. February 10 to March 16. Cost $225.
- Mechanical Engineering Refresher. February 11 to March 12. Cost $265.
- Civil Engineering Refresher. March 3 to April 7. Cost $265.

Professional Engineering Practice Liaison (PEPL) Program (206) 543-5539

The UW's College of Education established this program to provide continuing education opportunities to practicing engineers. Endorsement and primary support of the program comes from the Consulting Engineers Council of Washington (CECW), the Washington Chapters of the American Public Works Association (APWA), and the Seattle and Kitsap sections of the American Society of Civil Engineers (ASCE).

- Biofiltration for Storm Water Runoff Quality Enhancement (Eastern Washington). Spring 1992.
- Leak Detection, Site Assessment, and Remediation for Leaking Underground Tanks. Winter 1992.

The Technology Transfer (T²) Program is a nationwide effort financed jointly by the Federal Highway Administration (FHWA) and individual state departments of transportation. Its purpose is to translate into understandable terms the latest state-of-the-art technologies in the areas of roads, bridges, and public transportation to local and county highway and transportation personnel.

Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.

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